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The Preschool Academic Skills Test was developed from an analysis of first-grade reading and mathematics materials to identify those behaviors that were assumed to be in students' repertoires prior to first grade. The 105 items are grouped in 10 subtests: Vocabulary, Color Naming, Classification, Functional Relationships, Visual Matching, Auditory Matching, Picture Arrangement, Symbol Series, Counting, and Verbal Concepts . The test was administered to 428 4-year-olds from impoverished neighborhoods, to 326 middle-class 4-year-olds from private nursery schools, and to 120 5-year olds. Statistical analysis of the subtests showed the reliability of the total test score and the subtest scores to be very high. The compared test performances indicated that nondeprived children did better than deprived children; that kindergarten children did better than preschool children; and that girls did better than boys. Subtest intercorrelations were obtained for each of the subgroups. To determine the predictive validity, correlations were made among test results on this instrument given at the beginning of kindergarten and on the Detroit IQ Test given at the end of kindergarten, the Metropolitan Readiness Test given at the beginning of first grade, and the Metropolitan Achievement Test at the end of first grade. Tables are included. (CM)

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PRESCHOOL ACADEMIC SKILLS TEST

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THE PRESCHOOL ACADEMIC SKILLS TEST

With the introduction of Project Headstart, preschool education has become a reality not only for a large number of middle-class children, but a vast number of disadvantaged children as well. The passage of the Economic Opportunity Act of 1964 and the Elementary and Secondary Education Act of 1965 has given great impetus to the development of programs "to improve intellectual and social competence by intervention prior to school entrance (Gray & Miller, 1967).

In an attempt to maximize the impact of the preschool program the Office of Research of the Pittsburgh Public Schools set out to develop an instrument which would meet the following criteria:

1. It would measure specific skills that are prerequisites for successful cognitive experiences in the early grades.
2. It would provide diagnostic information on these skills which would enable the teacher to plan curriculum.
3. It could be individually administered by the teacher, permitting her to observe test behavior and incidentally keeping testing costs low.
4. It would be useful to a variety of programs regardless of psychological approach.

In order to determine the appropriate skills, an analysis was made of the first grade reading and mathematics materials of the leading

text book publishers to identify those behaviors that were assumed to be in the students repertoire prior to first grade. The behaviors common to most of the textbooks became the basis for the test items.

After an initial tryout and revision, the test of 130 items was administered to 428 four-year-olds from poverty neighborhoods and 326 middleclass four-year-olds from private nursery schools. In addition the test was administered to a smaller group of 120 five-year-olds.

A factor analysis of the interitem phi coefficients indicated that from seven to ten factors would account for most of the interitem correlation. This analysis, together with a reexamination of the content of the items, led us to discard 25 items and to group the remaining 105 items into ten subtests.

Table 1 (in the handout) presents the summary statistics for each of the ten subtests for the entire sample. In general, the means and standard deviations are appropriate. That is, the interval from two standard deviations below the mean to two standard deviations above the mean nearly coincide with the possible range. This reflects the fact that very few of the items are either too easy or too difficult. The Kuder-Richardson 20 reliabilities are all reasonable when the number of items is taken into account. One way to compare reliabilities based on different test lengths is to use an invariant statistic suggested by Gulliksen and called the "standard length of a test" by Woodbury. This is the theoretical number of items needed to achieve a reliability of .50. Subtests

2 and 3 have unusually low standard lengths, indicating that items on those scales are exceptionally homogeneous. Subtest 9 consists of a single item requiring the child to count ten circles, its reliability has been estimated by a test retest procedure on a different sample of students.

The reliability of the total test score is very high, 0.94, but not as high proportionately, as the subtest reliabilitites--its standard length is somewhat longer. This reflects the moderate heterogeneity of the separate subtests.

The intercorrelations of the ten subtests can be accounted for very well by a single common factor. The squared loadings on this factor are considerably lower than the corresponding reliabilities, permitting the inference that each subtest has a reliable specific component as well as a common part. That is, the factor analysis permits us to separate the reliable variance of each subtest into two independent components, the communality and the specificty. The last two columns of Table 1 show the loadings of each subtest on the common factor and on its own specific factor. Subtest 10 is the best single measure of the general factor, while a combination of test 10, 1, 3 and 5 would provide a good composite measure.

The test statistics are, in summary, very satisfactory for the total group. Next we wished to compare the test performance of various sub-groups within the total population, both to obtain a kind of validity information

and to determine the appropriateness of the test for the more extreme subgroups. Table 2 presents the means and standard deviations for various groups. With very few exceptions all differences between groups are statistically significant beyond the .05 or .01 level. Further, differences are in general what one would expect. Non-deprived children do better than deprived children, kindergarten children surpass pre-school school children, and in general, girls do better than boys. Subtest 1 is heavily loaded with animal names, and is in general biased toward boys, but otherwise the girls show their expected maturational superiority.

The subgroup means indicate that, for the most part, a satisfactory level of difficulty was obtained for each group. Some exceptions are Subtest VI Auditory Matching, which is too difficult for the Preschool Deprived Group, and several subtests, that were rather easy for the non-deprived kindergarten group. Apparently many middle-class children have the tested behaviors in their repetoire even at the beginning of kindergarten.

Intercorrelations of the ten subtests were obtained for each of the subgroups. The two most disparate sets of correlations come from the non-deprived versus deprived comparison. Table 3 shows the inter-correlations, reliabilities, and loading on common and specific factors for these two separate groups.

In general, the intercorrelations, and therefore the common factor loadings were lower for the deprived group, although with one exception the reliabilities were about the same. The differences are inconsequential for scales 1-5 and moderate for 7-10. Subtest 6 is atypical, showing a large drop shows in both the common factor loading and the reliability.

Subtest VI measures auditory discrimination using items like matching ends of words, i. e., rhyming and matching beginning sounds. Some work in Pittsburgh on teaching reading by the phonic method supports this finding that a large difference exists between deprived and non-deprived children in discriminating the sounds of standard English.

The problem of validity is a difficult one when dealing with a diagnostic test for preschool children. It was mentioned earlier that the items and subscales for the Preschool Academic Skills test were selected by analyzing the assumed entering behaviors and the specific content of the readiness and first grade reading and math programs of the leading text book publishers. For the skills that have been defined, the test has content validity. Further, the test discriminates reliability between various subgroups in accord with other known facts about the groups.

But what about predictive validity? Are the skills measured by this test actually prerequisite to good performance in Kindergarten, and first grade, and beyond? If these skills are important to academic success, the test should predict academic achievement. However, one problem arises. The most widely used criterion for academic success

are scores on a standardized achievement test. These tests are global and often do not measure many of the specific skills taught in the curriculum. This same condition also applies to readiness tests. If, then, one wishes to build a test which has both content and predictive validity, two types of skills are needed: (1) verbal skills that are imperative for coping with both the curriculum and standardized tests, and (2) more specific skills, undoubtedly still somewhat verbal in nature, but with other components that are more specific to certain elements in the curriculum. We would expect then, that some of our subtests would correlate very little with standard achievement and readiness measure, but other subtests should have good predictive validity.

Several predictive validity studies have been carried out. Although there are some interesting differences in validity among the subtests, this pattern is of secondary interest. The main story is told by the total test score. Table 4 shows, for our original kindergarten sample, the correlations among our Preschool Academic Skills Test, given at the beginning of Kindergarten, the Detroit IQ Test, given at the end of Kindergarten, the Metropolitan Readiness Test given at the beginning of first grade, and the Metropolitan Achievement Test given at the end of first grade.

The correlation between the Preschool Academic Skills Test and the Metropolitan Readiness Test taken 11 months later is .76. Whereas

the Detroit I. Q. test, given only four months before the readiness test, correlates only 0. 38 with readiness. The correlation between the Preschool Academic Skills test and the Detroit Intelligence Test is . 212. It would seem then, that the Preschool Test is measuring different factors than the intelligence test.

The Metropolitan Achievement test correlates 0. 67 with the preschool test, 0. 42 with the Detroit I. Q. and 0. 79 with the Readiness Test.

Turning now to the original four year old deprived sample, Table 5 shows the correlations between the Preschool Acadmeic Skills Test, the Detroit Intelligence Test and the Metropolitan Readiness Test. First grade achievement data will be available in June. The correlation between the Preschool Academic Skills Test and the Metropolitan Readiness test taken 23 months later is 0. 56. The correlation between the Detroit Intelligence Test and the Metropolitan Readiness Test taken four months apart is o. 60. Therefore, the Preschool test taken two years earlier does just about as good a job of predicting first grade readiness as the intelligence test taken four months before. We are still in the process of locating the non-deprived four-year-old sample.

The validity of our Preschool Academic Skills Test seems well established. Indeed it is surprising that one can do so well with a test for four-year-olds given by their teachers.

The validity of the test in turn establishes its diagnostic value. The test manual describes each scale, and gives some suggestions for further

testing in questionable cases. A second manual provides the teacher with suggestions for teaching each of the skills. Thus, the Preschool Academic Skills Test shows a great deal of promise as a useful classroom tool for teachers for maximizing their curriculum planning.

Tables for Preschool Academic Skills Test

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TABLE 1

Scale Statistics for Total Group (N = 854)

Subtest	No. of Items	Mean	S.D.	K-R 20 Rel.	K-R 20 Std. Length	Factor Loadings Common	Factor Loadings Specific
1. Vocabulary	18	15.62*	6.44	.816	4.5	.71	.56
2. Color Naming	8	5.26	2.58	.842	1.5	.57	.72
3. Classification	12	6.02	3.17	.817	2.7	.72	.54
4. Functional Relationships	4	3.02	1.09	.488	4.2	.50	.49
5. Visual Matching	20	13.26	4.17	.813	4.6	.74	.52
6. Auditory Matching	8	3.52	2.08	.643	4.4	.64	.49
7. Picture Arrangement	8	4.09	1.86	.591	5.7	.59	.50
8. Symbol Series	8	3.98	1.99	.597	5.4	.46	.62
9. Counting	1	0.50	0.50	.783**	**	.53	.58
10. Verbal Concepts	18	10.82	3.88	.781	5.0	.83	.31
Total Score	105	66.10	20.07	.939	6.8		

* Ten of the items are scored 0-1-2, so the possible range is 0-28.

** Reliability for this item calculated by test-retest. Standard length not comparable.

Table 2

Subtest Means and Standard Deviations for Subgroups

	1		2		3		4		5	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Non Deprived	19. 07	5. 47	6. 43	1. 92	7. 03	3. 12	3. 19	. 99	14. 42	3. 71
Deprived	12. 82	5. 78	4. 30	2. 65	5. 20	2. 97	2. 88	1. 14	12. 32	4. 29
Kindergarten	17. 88	5. 77	6. 22	2. 17	7. 47	2. 81	3. 35	. 89	15. 63	3. 04
Preschool	15. 28	6. 47	5. 11	2. 60	5. 80	3. 17	2. 97	1. 10	12. 90	4. 20
Kdg Non Dep.	20. 18	4. 92	7. 02	1. 46	8. 38	2. 37	3. 43	. 70	16. 52	2. 70
Kdg. Dep.	15. 31	5. 60	5. 33	2. 48	6. 46	2. 93	3. 26	1. 07	14. 65	3. 12
Preschool Non Dep.	18. 87	5. 54	6. 33	1. 97	6. 78	3. 18	3. 14	1. 03	14. 03	3. 74
Preschool Dep.	12. 49	5. 73	4. 16	2. 64	5. 04	2. 95	2. 83	1. 14	12. 02	4. 33
Male	16. 51	6. 45	4. 89	2. 66	6. 00	3. 21	2. 87	1. 11	12. 80	4. 31
Female	14. 78	6. 33	5. 61	2. 44	6. 05	3. 14	3. 16	1. 04	13. 71	3. 99
Total	15. 62	6. 44	5. 26	2. 58	6. 02	3. 17	3. 02	1. 09	13. 26	4. 17

	6		7		8		9		10		N
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	
Non Deprived	4. 37	2. 30	4. 76	1. 79	4. 35	1. 96	. 66	. 47	12. 54	3. 65	383
Deprived	2. 82	1. 57	3. 55	1. 74	3. 67	1. 96	. 38	. 48	9. 43	3. 48	471
Kindergarten	4. 44	2. 25	5. 39	1. 69	4. 66	1. 96	. 70	. 46	12. 80	3. 16	114
Preschool	3. 38	2. 02	3. 90	1. 81	3. 87	1. 97	. 47	. 50	10. 52	3. 89	740
Kdg. Non-Dep.	5. 55	2. 00	5. 78	1. 66	4. 97	2. 06	. 78	. 42	14. 07	2. 59	60
Kdg. Dep.	3. 20	1. 84	4. 94	1. 62	4. 31	1. 80	. 61	. 49	11. 39	3. 15	54
Preschool Non-Dep.	4. 16	2. 29	4. 57	1. 75	4. 24	1. 92	. 64	. 48	12. 25	3. 75	323
Preschool Dep.	2. 77	1. 53	3. 37	1. 68	3. 59	1. 97	. 35	. 48	9. 18	3. 44	417
Male	3. 37	2. 05	3. 97	1. 85	3. 80	2. 02	. 46	. 50	10. 58	3. 85	418
Female	3. 66	2. 10	4. 21	1. 86	4. 14	1. 95	. 55	. 50	11. 05	3. 90	436
Total	3. 52	2. 08	4. 09	1. 86	3. 98	1. 99	. 50	. 50	10. 82	3. 88	854

TABLE 3

Intercorrelations of 10 Subtests for deprived and non-deprived groups

	1	2	3	4	5	6	7	8	9	Common Factor	Specific Factor	Reliability
NON-DEPRIVED (Intercorrelations)												
1.	-									.65	.58	.76
2.	.31									.45	.75	.76
3.	.54	.34								.76	.50	.83
4.	.39	.28	.39							.53	.44	.47
5.	.46	.32	.56	.40						.75	.48	.79
6.	.40	.30	.51	.39	.50					.69	.50	.73
7.	.39	.27	.45	.30	.38	.41				.58	.51	.59
8.	.29	.19	.36	.27	.42	.42	.30			.52	.56	.59
9.	.35	.25	.43	.22	.48	.37	.25	.31		.54	.62	.82
10.	.57	.36	.63	.39	.66	.58	.55	.45	.47	.85	.26	.79
DEPRIVED												
1.	-									.61	.63	.77
2.	.40	-								.51	.75	.83
3.	.42	.35								.64	.61	.78
4	.34	.28	.42							.49	.54	.53
5.	.40	.34	.46	.42						.73	.53	.81
6.	.23	.17	.27	.17	.26	-				.41	.43	.35
7.	.30	.18	.27	.22	.35	.28	-			.48	.53	.51
8.	.14	.16	.15	.13	.27	.17	.25	-		.36	.68	.59
9.	.25	.30	.21	.08	.32	.14	.17	.22	-	.39	.66	.77
10.	.40	.31	.48	.37	.56	.33	.31	.34	.28	.73	.43	.70

TABLE 4

Validity Intercorrelations for the Kindergarten Sample

N = 69

	Preschool	Detroit	Met. Readiness	Met. Achievement
Preschool Test (beginning of Kindergarten)	----	.21	.76	.67
Detroit I. Q. (end of Kindergarten)	.21	----	.38	.42
Metropolitan Readiness(beginning of 1st grade)	.76	.38	----	.79
Metropolitan Achievement(end of 1st grade)	.67	.42	.79	----

TABLE 5

Validity Intercorrelations for the Preschool Deprived Group

N = 231

	Preschool	Detroit	Met. Readiness
Preschool Test (beginning of Preschool)	----	.43	.56
Detroit I. Q. (end of Kindergarten)	.43	----	.59
Metropolitan Readiness (beginning of 1st grade)	.56	.59	----

(Detailed intercorrelation tables among the subtests of each variable except the Detroit are available from the author.)